

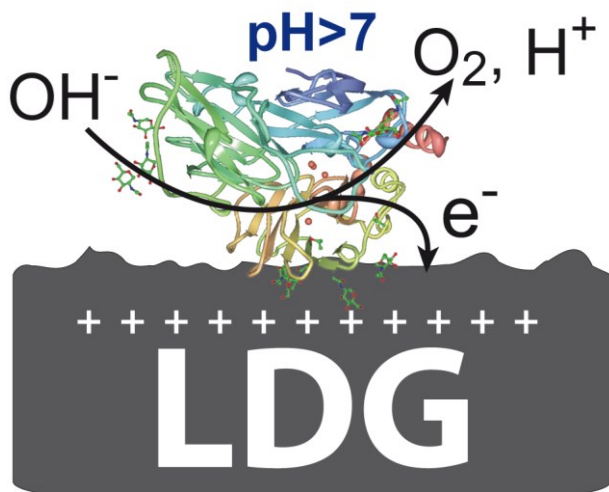
Bioelectrochemical Oxidation of Water

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The electrolysis of water provides a link between electrical energy and hydrogen, a high energy density fuel and a versatile energy carrier, but the process is very expensive¹. Indeed, the main challenge is to reduce energy consumption for large-scale applications using efficient renewable catalysts, which can be produced at low cost. Inspired by the water oxidation process catalyzed by inorganic Cu-complexes,² we present the multicopper oxidase laccase as the first ever enzyme reported able to catalyze electrooxidation of H₂O to molecular oxygen. Native and laboratory evolved³ laccases immobilized onto low-density graphite electrodes serve as bioelectrocatalytic systems with low overpotential and a high O₂ evolution ratio against H₂O₂ production during H₂O electrolysis. Our results open a new research ground on H₂O splitting as they allow overcoming serious practical limitations associated with artificial electrocatalysts used for O₂ evolution nowadays.



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- (2) Chen, Z.; Meyer, T. J., Copper(II) catalysis of water oxidation. *Angew. Chem. Int. Ed.* **2013**, 52 (2), 700-703.
- (3) Mate, D. M.; Gonzalez-Perez, D.; Falk, M.; Kittl, R.; Pita, M.; De Lacey, A. L.; Ludwig, R.; Shleev, S.; Alcalde, M., Blood tolerant laccase by directed evolution. *Chem. Biol.* 2013, 20 (2), 223-231.